

DEPAUL UNIVERSITY

Stairways and Ladders Manual

Environmental Health & Safety

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TABLE OF CONTENTS

SECTION	PAGE NO.
1.0 PURPOSE	2
2.0 SCOPE	2
3.0 RESPONSIBILITIES	2
4.0 GENERAL REQUIREMENTS	2
5.0 RULES FOR STAIRWAYS	3
5.1 Fixed Industrial Stairs	
5.2 Stair Treads and Platforms	
5.3 Stair Rail and Handrails	
6.0 PORTABLE LADDERS	4
6.1 Types of Portable Stepladders	
6.2 Unsafe Portable Ladders	
6.3 Portable Ladder Condition Assessment	
6.4 Portable Ladder Maintenance	
6.5 Choosing the Proper Portable Ladder for the job	
6.6 Portable Ladder Setup	
6.7 Portable Ladder Use	
7.0 FIXED LADDERS, CAGES, AND WELLS	8
7.1 Fixed Ladders	
7.2 Fixed Ladder Cages	
7.3 Fixed Ladder Wells	
7.4 Fixed Ladder Landing Platforms	
7.5 Fixed Ladder Safety Devices	
8.0 TRAINING REQUIREMENTS	12
APPENDIX A: Glossary	13
APPENDIX B: Ladder Photos	15
APPENDIX C: Program History	18

1.0 PURPOSE

The purpose of these requirements is to provide for the safe use of stairways and ladders by employees and visitors and to provide guidelines which reference the design and construction of fixed general industrial stairways (interior and exterior), portable extension ladders, stepladders, and permanent fixed ladders.

2.0 SCOPE

The Occupational Safety and Health Administration (OSHA) 29 CFR 1926.1050-1060 rules and minimum requirements apply to stairways and common types of ladders used by DePaul University employees including ladders used in construction, alterations, repair and demolition of worksites.

Other types of special ladders such as fruit picker ladders, combination step and extension ladders, stockroom stepladders, aisle way stepladders, shelf ladders and library ladders are not specifically covered by this program; however, use, maintenance and care sections apply.

3.0 RESPONSIBILITIES

- Environmental Health & Safety (EHS) is responsible for program development and review annually in compliance with all applicable regulations and industry consensus standards. EHS will also provide guidance and assistance in training.
- Department managers are responsible for identifying any existing or potential hazards and for identifying which employees require training prior to working on stairs and ladders.
- Supervisors must provide stairways and ladders required for working in hazard situations.
- Employees are responsible for following the procedure specified in this policy. Employees are responsible for the proper care, use and inspection of stairways and ladder their assigned to. Employees are expected to report any unsafe conditions to a supervisor.

4.0 GENERAL REQUIREMENTS

These rules specify when employers must provide stairways and ladders. In general, the standards require the following:

- When there is a break in elevation of 19 inches or more and no ramp, runway, embankment or personnel hoist is available, employers must provide a stairway or ladder at all worker points of access. Note: Use of make-shift climbing aides such as boxes, barrels, paint cans, carts, desks, chairs, etc., in place of the proper ladder, is not an acceptable or safe work practice.
- When there is only one point of access between levels, employers must keep it clear of obstacles to permit free passage by workers. If free passage becomes restricted, employers must provide a second point of access and ensure that workers use it.
- When there are two or more points of access between levels, employers must ensure that at least one point of access remains clear. In addition, employers must install all stairway and ladder fall protection systems required by these rules and ensure that their worksite meets

all requirements of the stairway and ladder rules before employees use stairways or ladders.

- Sufficient illumination will be provided in all areas where stairways and ladders are in use.

5.0 RULES FOR STAIRWAYS

5.1 Fixed Industrial Stairs

Fixed stairs shall be provided for access from one structure to another where operations demand regular travel between levels and for access to operating platforms at any equipment that requires attention routinely during operations. Fixed stairs shall also be provided where access to elevations is daily or at each shift for such purposes as gauging, inspection, regular maintenance, etc., where such work may expose employees to acids, caustics, gases, or other harmful substances, or for which purposes the carrying of tools or equipment by hand is normally required. (This does not preclude the use of fixed ladders for access to fixed tanks, towers, and similar structures, overhead traveling cranes, etc. where the use of fixed ladders is a common practice.) Spiral stairways shall not be permitted except for special limited usage and secondary access situations where it is not practical to provide a conventional stairway. Winding stairways may be installed on tanks and similar round structures where the diameter of the structure is not less than five feet.

Fixed stairways shall be designed and constructed to carry a load of five times the normal live load anticipated but never of less strength than to carry safely a moving concentrated load of 1,000 pounds. Fixed stairways shall also have a minimum width of 22 inches.

5.2 Stair Treads and Platforms

All treads shall be reasonably slip-resistant and the nosing shall be of non-slip finish. Welded bar grating treads without a nosing are acceptable providing the leading edge can be readily identified by personnel descending the stairway and provided the tread is serrated or is of definite non-slip design. Rise height and tread width shall be uniform throughout any flight of stairs including any foundation structure used as one or more treads of the stairs.

Stairway platforms shall be no less than the width of a stairway and a minimum of 30 inches in length measured in the direction of travel. Vertical clearance above any stair tread to an overhead obstruction shall be at least 7 feet measured from the leading edge of the tread.

Fixed stairs shall be installed at angles to the horizontal of between 30 and 50 degrees. Any uniform combination of rise/tread dimensions may be used that will result in a stairway at an angle to the horizontal within the permissible range.

5.3 Stair Rails and Handrails

The following apply to all stair rails and handrails.

- A stairway having four or more risers, or rising more than 30 inches in height, whichever is less, must have at least one handrail provided on closed stairways preferably on the right side descending. A stair rail must also be installed along each unprotected side or edge. When the top edge of a stair rail system also serves as a handrail, the height of the top edge

must not be more than 37 inches nor less than 36 inches from the upper surface of the stair rail to the surface of the tread.

- Employees should always use handrails whenever ascending or descending stairs.

6.0 PORTABLE LADDERS

6.1 Types of Portable Ladders

The most common types of portable ladders in use at DePaul University are:

- Self-supporting stepladders.
 - Type I Industrial stepladder: 3 to 20 feet for heavy duty use, 250 pounds working load such as utilities, contractor, and industrial use.
 - Type II Commercial stepladder: 3 to 12 feet for medium duty, 225 pounds working load such as painters, offices, and light industrial use.
 - Type III Household stepladder: 3 to 6 feet for light duty, 200 pounds working load such as light household use. Type III ladders are not permissible for use by maintenance and cleaning personnel.
 - Design criteria for self-supporting step ladders include:
 - A metal spreader or locking device of sufficient size and strength shall be a component of each stepladder to securely hold the front and back sections in open positions. For Type III ladders, the pail shelf and spreader may be combined in one unit (The so-called shelf-lock ladder).
 - Uniform step spacing shall be employed that is no more than 12 inches. Steps shall be parallel and level when the ladder is in position for use.
 - The minimum width between side rails at the top, inside to inside, shall be not less than 11.5 inches. From top to bottom, the side rails shall spread at least 1 inch for each foot of length of stepladder.
- Non-self-supporting straight ladders: Single section ladders which may be of wooden, metal, or fiberglass construction up to 30 feet in length. (Note: Maintenance and cleaning staff are prohibited from using wood ladders per Facility Operations department policy.)
- Non-self-supporting extension ladders: May be of wooden, metal or fiberglass construction up to a maximum of 60 feet in length. All two-section extension ladders shall consist of two sections, one to fit within the side rails of the other, and arranged in such a manner that the upper section can be raised and lowered. Extension ladders must be equipped with positive stops to insure the minimum overlap. (Note: Maintenance and cleaning staff are prohibited from using wood ladders per Facility Operations department policy.)

6.2 Unsafe Portable Ladders

The following types of portable ladders are considered unsafe and are not approved for use at DePaul University:

- Self-supporting stepladders longer than 20 feet.
- Non-self-supporting straight ladders longer than 30 feet.
- Two-section feet extension ladders longer than 60 feet.
- Trestle ladders, or extension sections or base sections of extension trestle ladders longer than 20 feet.
- Painter stepladders longer than 12 feet.
- Mason ladders longer than 40 feet.
- Trolley ladders and side-rolling ladders longer than 20 feet.

6.3 Portable Ladder Condition Assessment

- All types of portable ladders must be inspected by a qualified person before use and following any event that could affect the ladder's integrity. Including, but not limited to the following:
 - If ladders tip over, inspect for dents, cracks, or other damage. Also check hardware connections along rung to side rail connections.
 - If ladders are exposed to oil and grease or other slippery/chemical substance. The ladder shall be cleaned or removed from service and obviously marked until it is properly cleaned or disposed.
- Those ladders that have developed structural defects, shall be withdrawn from service and destroyed. Specifically:
 - The joints between the steps and side rails shall be tight, all hardware and fittings securely attached, and all movable parts shall operate freely without binding or undue play.
 - All warning labels, rating labels and other safety-related decals must be present and legible. Replacement labels and decals are available for a nominal fee from most ladder manufacturers. No other stickers should be present on ladders as they may hide structural defects.
 - Rungs must be in good condition without dents, cracks, splits or deformation.
 - Rungs must be knurled, textured or coated with a non-slip surface. Rungs must also be free of grease, oil, and other slippery substances that may present a slipping hazard.

- For portable wooden ladders: All wood parts shall be free from sharp edges and splinters; sound and free from shake, wane, compression, failures, decay or other irregularities. Construction-grade lumber should be used for all components. Low-density wood shall not be used. The side rails should be continuous and if there are splices, they should be the same strength as a continuous rail of the same length.
- For portable metal ladders: All parts shall be free from sharp edges; sound and free from dents, bends or other obvious signs of structural distress.
- For portable fiberglass ladders: All parts shall be free from cracks, splinters, holes or other obvious signs of structural distress. Fiberglass ladders must also be stored in a manner which protects them from excessive ultraviolet exposure, which may weaken the ladder over time.

6.4 Portable Ladder Maintenance

- Ladders used for dirty tasks shall be properly cleaned prior to storage.
- Metal bearings of locks, wheels, pulleys, and other ladder parts shall be lubricated on an as needed basis.
- Frayed or badly worn extension ladder ropes shall be replaced with a similar like and kind of rope.
- Safety and other auxiliary add-on equipment shall be kept in good condition, attached and torqued to manufacturer specifications and used only in the manner, as specified by the manufacture, to ensure proper and safe performance.
- Iron ladders and appurtenances shall be painted or otherwise treated to resist corrosion and rusting when location demands.
- Wooden ladders, when used under conditions where decay may occur, shall be treated with a non-irritating preservative, and the details shall be such as to prevent or minimize the accumulation of water on wood parts.

6.5 Choosing the Proper Portable Ladder for the Job

- Ladders must not be loaded beyond the maximum intended load for which they were built or beyond the manufacturer rated capacity. When selecting an appropriate ladder and determining the load for the intended work, the weight of the employee, all tools, and equipment must all be considered.
- Choose the correct height of ladder for the task being performed. The top step of self-supporting ladders and top rung (or rungs) of extension ladders are not to be stood upon. Likewise, two shorter ladders may not be lashed together or combined to make a longer ladder.

- Unless otherwise labelled: Portable ladders are designed as a one-man working ladder based on a 200-pound load.
- Ladders should only be used for the purpose for which they were designed. Do not use a self-supporting ladder as a non-self-supporting ladder. Do not use an extension ladder as a scaffolding plank, brace, etc.
- Use only ladders with non-conductive side rails where the worker or the ladder could contact exposed energized electrical equipment.

6.6 Portable Ladder Setup

- Ladders must be used only on stable and level surfaces unless properly secured to prevent accidental movement.
- Equip ladders with non-slip bases when there is a hazard of slipping. Note: Non-slip bases are not intended as a substitute for care in safely placing, lashing, or holding a ladder that is being used upon oily, metal, concrete, or slippery surfaces.
- Portable ladders shall, where possible, be used at such a pitch that the horizontal distance from the top support to the foot of the ladder is one-quarter of the working length of the ladder (The length along the ladder between the foot and the top support).
- Do not place ladders in front of doors that open toward the ladder unless the door is blocked, locked, or guarded.
- The area around the top and bottom of the ladders must be kept clear.
- Do not place ladders on boxes, barrels, or other unstable bases to obtain additional height.
- When portable ladders are used for access to an upper landing surface, the side rails must extend at least 36 inches above the upper landing surface. The ladder must be secured and a grasping device, such as a grab rail, must be provided to assist workers in mounting and dismounting the ladder. A ladder extension must not deflect under a load that would cause the ladder to slip off its support.
- The top of a non-self-supporting ladder must be placed with two rails supported equally unless it is equipped with a single support attachment.
- On two-section extension ladders must be equipped with positive stops to insure the minimum overlap for the two sections in use shall be as follows:

Size of Ladder (feet)	Overlap (feet)
Up to and including 36	3
Over 36 up to including 48	4
Over 48 up to including 60	5

6.7 Portable Ladder Use:

- Look up before climbing to ensure a safe ascent.
- Always maintain at three points of contact when moving on the ladder i.e. two hands and one foot, or two feet and one hand. (Also applies to fixed ladder use.)
- Always face the ladder when ascending or descending. (Also applies to fixed ladder use.)
- Do not climb on the bracing of a ladder. The bracing is designed to increase stability, not to hold the weight of a worker. The backside of the ladder can be used if it is designed and provided with steps for climbing on both front and rear sections.
- Do not overreach while on a ladder. Keep your weight and center of gravity over the ladder frame at all times. (Also applies to fixed ladder use.)
- Ladders must not be moved, shifted or extended while in use. When moving a ladder, always dismount, reposition and then re-secure the ladder prior to climbing.
- Do not climb a ladder while carrying any object or load that could cause loss of balance and lead to a fall. Utilize tool belts, materials lifts, co-workers or other forms of assistance to safely move tools and materials to the work site. (Also applies to fixed ladder use.)

7.0 FIXED LADDERS, CAGES, WELLS, PLATFORMS, SAFETY DEVICES

All fixed ladders, appurtenances, and fastenings shall be designed to meet the following requirements:

7.1 Fixed Ladders

- When different types of materials are used in the construction of a ladder, the materials used shall be so treated as to have no deleterious effect one upon the other.
- Design Load: Fixed ladders must be able to support at least two loads of 250 pounds each, concentrated between any two consecutive attachments. Fixed ladders also must support added anticipated loads caused by ice buildup, winds, rigging and impact loads resulting from using ladder safety devices.
- Rung Diameter: All rungs shall have a minimum diameter of three-fourths inch for metal ladders, except as covered in OSHA 1010.27 (b)(7)(i) and a minimum diameter of 1.125 inches for wood ladders. The rungs of an individual-rung ladder shall be so designed that the foot cannot slide off the end. Ladders formed by individual metal rungs imbedded in concrete, which serve as access to pits and to other areas under floors, are frequently located in an atmosphere that causes corrosion and rusting. To increase rung life in such atmosphere, individual metal rungs shall have a minimum diameter of 1 inch.
- Rung Distance: The distance between rungs, cleats, and steps must not exceed 12 inches and must be uniform throughout the ladder.
- Rail Distance: The clear length between rungs or cleats must be at least 16 inches.

- **Gripping Surfaces:** Side rails, which might be used as a climbing aid, shall be free of cross sections as to afford adequate gripping surface without sharp edges, splinters, or burrs.
- **Clear Width:** A clear width of at least 15 inches must be provided each way from the centerline of the ladder, except when cages or wells are in use.
- **Clearance Climbing Side:** The perpendicular distance from the centerline of the rungs to the nearest permanent object on the climbing side of the ladder must be at least 30 inches for a ladder pitch of 90-degrees.
- **Clearance Mounting Surface Side:** The distance from the centerline rungs, cleats, or steps to the nearest permanent object must be at least 7 inches.
- **Step-Across Distance:** The step-across distance from the nearest edge of ladder to the nearest edge of equipment or structure must not be more than 12 inches or less than 2.5 inches. Where the step-across distance is greater than 12 inches, a landing platform shall be provided. The minimum step-across distance to the platform shall be 2.5 inches.
- **Extension Rails:** The side rails of the through ladder extensions shall extend 42 inches above parapets and landings. For through ladder extensions, the rungs shall be omitted from the extensions and will have 18 to 24 inches between rails.
- **Pitch:** The preferred pitch of fixed ladders shall be considered to come in the range of 75 degrees and 90 degrees with the horizontal. Fixed ladders shall be considered as substandard if they are installed within the substandard pitch range of 60 and 75 degrees with the horizontal. Substandard fixed ladders are permitted only where it is found necessary to meet conditions of installation. This substandard pitch range shall be considered as a critical range to be avoided, if possible. Ladders having a pitch in excess of 90 degrees with the horizontal are prohibited.
- **Anchoring:** All anchoring points connecting fixed ladder to the wall must be solid, and properly bolted or welded
- **Section Connections:** All connections between sections of a fixed ladder must be securely welded or bolted without sharp edges to impede safe gripping of ladder surfaces
- **Corrosion Protection:** Fixed ladders exposed to outside weather or corrosive atmospheric conditions must be galvanized or suitably painted to protect components from oxidation and rust damage. Also, adequate means shall be employed to protect dissimilar metals from electrolytic action, when such metals are joined.
- **Access:** Fixed ladders must be secured behind locked doors, cages or on locked rooftops so as to prevent access by the general public.

7.2 Fixed Ladder Cages

- **When Required:** Cages shall be provided on ladders of more the 24 feet to a maximum unbroken length of 30 feet.

- Attachment: Horizontal cage bands must be securely fastened to the side rails of the ladder or directly to the structure, building or equipment the ladder is affixed to.
- Horizontal Bands: Horizontal bands must be spaced at intervals no more than 4 feet apart centerline to centerline
- Vertical Bars: Vertical bars must be on the inside of the horizontal bands and fastened to them. Vertical bars must be at intervals of no more than 9.5 inches from centerline to centerline.
- Ladder to Cage Spacing: Cages must not extend less than 27 inches or more than 30 inches from the centerline of the rung and must not be less than 27 inches wide.
- Projections: The inside of cages must be clear of projections.
- Bottom Height: The cage bottom must be between 7-8 feet above the bottom access point of the ladder.
- Bottom Flare: The bottom of the cage must be flared at least 4 inches between the bottom horizontal band and the next higher band.
- Top of Cage Height: Tops of cages must be at least 42 inches above the top of the platform or top access point of the ladder. There must be an unobstructed path to the platform or point of access.

7.3 Fixed Ladder Wells

- Clear Width: Ladder wells shall have a clear width of at least 15 inches measured each way from the centerline of the ladder. Smooth-walled wells shall be a minimum of 27 inches from the centerline of rungs to the well wall on the climbing side of the ladder. Where other obstructions on the climbing side of the ladder exist, there shall be a minimum of 30 inches from the centerline of the rungs.
- Encirclement: Wells must completely encircle the ladder.
- Well Bottom Height: The bottom of the well above the point of access to the bottom of the ladder must be between 7 and 8 feet.

7.4 Fixed Ladder Landing Platforms

- If the total length of the climb on a fixed ladder equals or exceeds 24 feet, the ladder must be equipped with ladder safety devices; **or** self-retracting lifelines and rest platforms at intervals not to exceed 150 feet; **or** a cage or well and multiple ladder sections with each ladder section not to exceed 50 feet in length. These ladder sections must be offset from adjacent sections and landing platforms must be provided at maximum intervals of 50 feet.
- Step-Across Requirements: Where the distance is greater than 12 inches from the centerline of the rung of a ladder to the nearest edge of structure or equipment, a landing platform shall be provided. The minimum step-across distance shall be 2.5 inches.

- Railing Requirements: All landing platforms shall be equipped with standard railings and toe-boards, so arranged as to give safe access to the ladder.
- Platform Size Requirements: Platforms shall be not less than 24 inches in width and 30 inches in length.
- Rung Spacing: One rung of any section of ladder shall be located at the level of the landing laterally served by the ladder. Where access to the landing is through the ladder, the same rung spacing as used on the ladder shall be used from the landing platform to the first rung below the landing.
- Rail Extensions: The side rails of through or side-step ladder extensions shall extend 42 inches above parapets and landings. For through ladder extensions, the rungs shall be omitted from the extension and shall have not less than 18 and not more than 24 inches clearance between rails. For side-step or offset fixed ladder sections, at landings, the side rails and rungs shall be carried to the next regular rung beyond or above 42 inches.
- Grab bars: If grab bars are in use, they must be spaced by a continuation of the rung spacing when they are located in the horizontal position. Vertical grab bars shall have the same spacing as the ladder side rails. Grab-bar diameters shall be the equivalent of the round-rung diameters.

7.5 Fixed Ladder Safety Devices

- Lifeline Connection: [See Fall Protection](#)
- Hands Free Operation: All safety devices must permit the worker to ascend or descend without continually having to hold, push or pull any part of the device, leaving both hands free for climbing.
- Activation Requirement: All safety devices must activate within 2 feet after a fall occurs and limit the descending velocity of an employee to 7 feet/second.
- Attachment Requirement: The connection between the carrier or lifeline and the point of attachment to the body belt or harness must not exceed 9 inches in length.
- Rigid Carrier Mounting: Mountings for rigid carriers must be attached at each end of the carrier, with intermediate mountings spaced along the entire length of the carrier, to provide necessary strength to stop falls.
- Flexible Carrier Mounting: Mountings for flexible carriers must be attached at each end of the carrier. Cable guides for carriers must be installed between 25-40 feet along the entire length of the carrier, to prevent damage to the system.
- Installation: Design and installation of mountings and cable guides must not reduce the strength of the ladder.

- Side Rails: Side rails and steps or rungs for side-step fixed ladders must be continuous in extension.

8.0 TRAINING REQUIREMENTS

A training program must be provided for each employee using ladders and stairways. The program must enable each employee to recognize hazards related to ladders and stairways and to use proper procedures to minimize these hazards. For construction operations, additional employee training is required.

Employees must be trained by a competent person in the following areas, as applicable:

- The nature of fall hazards in the work area. This includes assessment of the area surrounding the work area to identify any slip or trip hazards, traffic hazards, and/or the proximity to electrical wiring/equipment.
- The correct procedure for erecting, maintaining and disassembling the fall protection systems to be used.
- The proper construction, use, placement and care in use of all stairways and ladders.
- The maximum intended load carry capacities of ladders used.

Retraining must be provided for each employee as necessary so that the employee maintains the understanding and knowledge acquired through use of safe work practices, procedures and equipment.

APPENDICES

APPENDIX A: GLOSSARY

- **Cleat:** A ladder crosspiece of rectangular cross section placed on edge upon which a person may step while ascending or descending a ladder.
- **Competent Person:** One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them [29 CFR 1926.32 (f)]. By way of training and/or experience, a competent person is knowledgeable of applicable standards, is capable of identifying workplace hazards relating to the specific operation, and has the authority to correct them. Some standards add additional specific requirements which must be met by the competent person.
- **Double-cleat ladder:** A ladder with a center rail to allow simultaneous two-way traffic for employees ascending or descending.
- **Failure:** Load refusal, breakage or separation of components.
- **Fixed ladder:** A ladder that cannot be readily moved or carried because it is an integral part of a building or structure.
- **Handrail:** A rail used to provide employees with a handhold for support.
- **Job-made ladder:** A ladder that is fabricated by employees, typically at the construction site; non-commercial manufactured.
- **Load refusal:** The point where the structural members lose their ability to carry the load.
- **Point of access:** All areas used by employees for work-related passage from one area or level to another.
- **Portable ladder:** A ladder that can be readily moved or carried.
- **Riser height:** The vertical distance from the top of a tread or platform/landing to the top of the next higher tread or platform/landing.
- **Side-step fixed ladder:** A fixed ladder that requires a person to get off at the top to step to the side of the ladder side rails to reach the landing.
- **Single-cleat ladder:** A ladder consisting of a pair of side rails connected together by cleats, rungs or steps.
- **Stair rail system:** A vertical barrier erected along the unprotected sides and edges of a stairway to prevent employees from falling to lower levels.
- **Temporary service stairway:** A stairway where permanent treads and/or landings are to be filled in at a later date.

- **Through fixed ladder:** A fixed ladder that requires a person getting off at the top to step between the side rails of the ladder to reach the landing.
- **Tread depth:** The horizontal distance from front to back of a tread, excluding nosing, if any.

APPENDIX B: LADDER PHOTOS





Step ladder



Fixed ladder landing platforms

APPENDIX C: PROGRAM HISTORY

Date	Revision Number	Brief Description of Changes	Review Completed by
5/16/2016	1	Re-worded	J. Graham

ACKNOWLEDGEMENTS

This manual was developed using best practice examples from the Occupational Safety and Health Administration (OSHA).

EHS will review and evaluate this manual on an annual basis, or when changes occur to 29 CFR 1926.1050-1060 that prompt revision of this document, or when Facility Operations (FO) changes occur that require a revision of this document. Effective implementation of this program requires support from all levels of management at DePaul. This written program will be communicated to all personnel that are affected by it and will encompass the total workplace, regardless of the number of workers employed or the number of work shifts.